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Published in:
International Journal of Educational Research

DOI:
10.1016/j.ijer.2020.101534

International Journal of Educational Research 100 (2020) 101534

Contents lists available at ScienceDirect

International Journal of Educational Research

journal homepage: www.elsevier.com/locate/ijedures

Registered report

Between lethal and local adaptation: Lesson study as an organizational routine

Fenna Wolthuis[a,*], Klaas van Veen[a], Siebrich de Vries[a], Mireille D. Hubers[b]

[a] University of Groningen, Teacher Education, Grote Kruisstraat 2/1, 9712 TS, Groningen, the Netherlands
[b] University of Twente, Educational Science, De Zul 10, 7522 NJ, Enschede, the Netherlands

ARTICLE INFO

Keywords:
Lesson study
Organizational routines
Professional development
Local adaptation

ABSTRACT

Professional development practices remain at the forefront of ways to support teacher learning but are difficult to sustain. We investigate whether and how teachers continued to perform the professional development practice of lesson study in their own schools after participating in a cross-school Lesson Study Professional Learning Network for four years. We found different perceptions of the general idea of lesson study. If the general idea was modified, teachers rarely continued to perform lesson study; if they did, they transformed lesson study in such a way that core elements were removed. When teachers maintained the general idea of lesson study they were more likely to continue to perform lesson study in their own school and to consider the practice useful.

1. Introduction

Professional development (PD) practices remain at the forefront of ways to support teacher learning. Although much is known about which characteristics PD practices need to have to be effective, maintaining and sustaining effective PD practices in schools remains a considerable challenge (Desimone & Stuckey, 2014; Hargreaves & Goodson, 2006). One such PD practice which potentially contains all characteristics of effective PD but proves difficulty to sustain in schools is lesson study. Lesson study has gained increasing global attention in the past 30 years. Lesson study is translated from the Japanese *jugyou kenkyuu*, with the first word meaning "live instruction" or "lessons" and the second "research" or "study" (Lewis, 2016). Lesson study involves a research cycle with phases during which teachers collaboratively investigate their own teaching practice (Lewis, Perry, & Murata, 2006). It can support teacher and student learning in new contexts (Cajkler, Wood, Norton, & Pedder, 2014; Schipper, Goei, de Vries, & van Veen, 2018; Xu & Pedder, 2014) but is difficult to sustain. Often, lesson study initiatives are short-lived and simplified (Akiba, 2016; Lee, 2015; Takahashi & McDougal, 2016).

Specifically, when lesson study is adopted in international contexts, several researchers (e.g. Akiba, 2016; Takahashi & McDougal, 2016) have argued that it does not always "stay true" to the Japanese model. The question of how lesson study can become an embedded practice in schools outside Japan relates to the implementation fidelity and local adaptations debate (Anderson, 2017). Depending on the approach taken, different views have emerged on what is considered acceptable when lesson study is adopted internationally. In a fidelity approach, lesson study should be understood and performed as in Japan. The local adaptations approach, by contrast, allows for adjustments to the practice as long as teachers adhere to its core elements (Quinn & Kim, 2017). Generally, the

* Corresponding author.
E-mail addresses: f.wolthuis@rug.nl (F. Wolthuis), klaas.van.veen@rug.nl (K. van Veen), s.de.vries@rug.nl (S. de Vries), m.d.hubers@utwente.nl (M.D. Hubers).

https://doi.org/10.1016/j.ijer.2020.101534
Received 26 July 2019; Received in revised form 10 December 2019; Accepted 20 January 2020

implementation debate applies not just to PD practices that are adopted from another culture but to any PD practice taken up in schools. PD practices always need to be interpreted and performed by teachers, making discussions about adaptations and faithful implementations apply to other forms of PD as well. For example, research on data use, another PD practice, also engages in questions of how the practice needs to be taken up by teachers and the extent to which teachers may adjust or stay faithful to the core elements of data use (Coburn & Turner, 2011; Hubers, Schildkamp, Poortman, & Pieters, 2017). As such, while our discussion focuses specifically on lesson study, the questions and problems surrounding embedding lesson study apply to PD in general.

Given the above, investigating how lesson study can become embedded involves two separate questions: (1) Which core elements of lesson study should be embedded? and (2) How is lesson study actually embedded in practice? In this paper, we take a local adaptations approach, arguing that lesson study can be modified as long as core elements are preserved. We apply the concept of organizational routines to examine whether and how teachers embed lesson study in their own school settings after learning to use it. We aim to contribute to the small but growing body of empirical studies examining lesson study in practice in new international contexts. In this study, we investigate teachers who took part in a cross-school Lesson Study Professional Learning Network (LSPLN) for four years, during which they performed six cycles. The LSPLN was set up to develop teacher learning and was designed to enable teachers to introduce lesson study into their own schools and to continue with the practice as a lesson study facilitator with their own colleagues after training had ended. By examining whether and how teachers maintained or modified lesson study as an organizational routine and how doing so connected with their continued performance of the cycle, we aim to provide more insight into how lesson study can become embedded in school settings new to the practice.

2. Theoretical background

2.1. Organizational routines

One useful way to investigate how PD practices, such as lesson study, can become embedded in practice is by framing them as organizational routines (Hubers et al., 2017; Spillane, 2012). Organizational routines broadly refer to “repetitive, recognizable patterns of interdependent action, carried out by multiple actors” (Feldman & Pentland, 2003, p. 95). Schools, as with any other organization, have various organizational routines, such as parent–teacher meetings, grade-level or department meetings, and teacher evaluations (Sherer & Spillane, 2011). Organizational routines contain an internal structure, which consists of the general idea and specific performances of a routine. Feldman and Pentland (2003) refer to the general idea as the *ostensive* aspect and to specific performances as the *performative* aspects of a routine. The ostensive part is the routine in principle. It represents “the ideal or schematic form of a routine. It is the abstract, generalized idea of the routine” (Feldman & Pentland, 2003, p. 101). By contrast, the performative aspect “consists of specific actions, by specific people, in specific places and times” (p. 101). The ostensive and performative aspects are recursively related: within performance of the routine, the ostensive aspect is created and re-created; in turn, the ostensive aspect constrains and enables performance of the routine. Organizational routines, in this sense, are capable of endogenous change, as people – either deliberately or unconsciously – “produce variations on a routine, to select these variations, and to retain them as what it means to do this particular routine” (Feldman & Pentland, 2003, p. 113). The variations that can occur during performances can, in turn, lead to changes in the ostensive aspect of the routine (Sherer & Spillane, 2011; Spillane, 2012). In this sense, the concept of organizational routines allows for an investigation of how ways of working are modified or maintained, which makes it a useful concept to examine whether and how teachers adapt lesson study as presented during the LSPLN and whether and how they embed it in their own practice.

2.1.1. Usefulness

Understanding why some organizational routines become embedded in organizations while others do not also depends on whether they are considered useful (Witt, 2011). A routine’s usefulness involves the appropriateness of the design (Witt, 2011). Examining a lesson study’s usefulness and feasibility for practicing teachers is especially important to consider in our context, because though lesson study potentially contains all effective design principles, teachers do not always evaluate it positively (Brosnan, 2014). To date, no studies have explored in depth why teachers do or do not consider the practice useful.

2.1.2. Organizational routines in education

Educational scholars interested in exploring work processes within schools have recently turned their attention to organizational routines (Coburn, Mata, & Choi, 2013; Spillane, 2012). For example, Roegman and Riehl (2015) investigate the potential of rounds as a new organizational routine to transform the practice of preservice teachers. They show that teachers made use of this possibility to a limited degree, due to the newness of the practice. Other authors investigate the implementation of data use, revealing that schools struggle to develop organizational routines and that the development of the ostensive aspect was especially scarce or lacking (Hubers et al., 2017). Sherer and Spillane (2011) show that the introduction of a five-week assessment routine enabled both constancy and change in practice over time. On the one hand, the ostensive script helps structure school practice and interactions; on the other, it never completely specifies action people need to take during performances of the routine. During performance of a routine, teachers and school leaders “changed the routine as they repaired and expanded it and as they strived to make it better”, leading to changes in the ostensive aspect of the routine (Sherer & Spillane, 2011, p. 642).

Table 1
Definition and operationalization of lesson study as an organizational routine.

Aspect	Operationalizations
Ostensive	The general script of lesson study
Performative	Continued performance of lesson study
Usefulness	Evaluation of the appropriateness of the design of lesson study

2.2. Lesson study as an organizational routine

We investigate lesson study as an organizational routine that contains the ostensive and performative aspects and examine how teachers perceive its usefulness. (see Table 1 for an overview). In the following sub-sections, we discuss what is known from the lesson study literature on these aspects and how lesson study was introduced and performed during the LSPLN.

2.2.1. Ostensive

The general script of lesson study involves the core elements of the research cycle. During the LSPLN, teachers worked with a version closely aligned with the Japanese cycle; it was based on both the American adaptation by Stepanek, Appel, Leong, Turner Mangan, and Mitchell (2007) and the British adaptation by Dudley, 2011, which contains case pupils. This cycle contains six phases. During phase 1, the group formulates a lesson goal and long-term goals for students and develops a research question. In phase 2, the research lesson is planned, which includes developing SMART (specific, measurable, acceptable, realistic, and time-bound) lesson goals, choosing case pupils, and describing expected student responses. Teachers are advised to undertake a literature study, make an inventory of good practices, and/or explore team members' (practical) knowledge in the course of designing the research lesson (de Vries, Verhoef, & Goei, 2016). In phase 3, the lesson is taught and then case pupils are interviewed. Phase 4 consists of the post-lesson discussion, which focuses on the research goal and student learning. In phase 5, the team revises the lesson and teaches it again. In phase 6, the group reflects on the entire lesson study process and shares their gained insights with the wider school staff. Fig. 1 presents a graphical representation of this cycle.

Studies have shown that how teachers interpret lesson study varies and can develop as they gain more experience with the practice. Research reports that teachers often misunderstand lesson study as lesson planning instead of teacher research (Fujii, 2014; Lewis et al., 2006; Yoshida, 2012). Bocala (2015) finds that teachers without lesson study experience focus most on the observing phase whereas teachers with more lesson study experience focus more on student learning. By contrast, Durden (2018) demonstrates that what teachers consider elements of learning study (a variant of lesson study) fall on a continuum of increasing complexity, from improving lessons by following a process to transforming student understanding through conceptual change; the more complex teachers' understanding of lesson study, the more elements they ascribed to the practice.

2.2.2. Performative

Table 2 presents an overview of the possible elements in lesson study according to Takahashi and McDougal (2016). Following Stepanek et al. (2007), we consider the phases of the research cycle core elements of lesson study captured by elements 0–VIIII. Teachers in new contexts often leave out elements that distinguish lesson study as a research process. For example, Seleznyov (2018) shows that international lesson study practices did not always include identification of a research theme (33 %), studying curriculum material (63 %), or live observation of lessons (8 %).

Optional elements of the cycle are phases 0, IX, and X. In Japan, element III entails studying curriculum material. In our context, we consider this element open to local adaptation. In Japan, learning "goals are widely shared and specified with lesson-level precision" (Hiebert & Stigler, 2017, p. 2), whereas the Netherlands has no national curriculum (Nieveen & Kuiper, 2012). Teachers need to teach toward Core Curriculum Standards, but these general objectives still provide teachers with substantial freedom to decide what and how to teach. In addition, research has shown that Japanese curricula are well designed to study student learning, which is often absent in curricula outside Japan (Lewis, Perry, & Friedkin, 2011). As such, in the absence of well-suited curriculum material, the Dutch lesson study advises undertaking literature review and sharing personal teaching expertise as ways to design the research lesson (de Vries, Roorda, & van Veen, 2017). In this sense, the Dutch model does not hold as tightly to the traditional

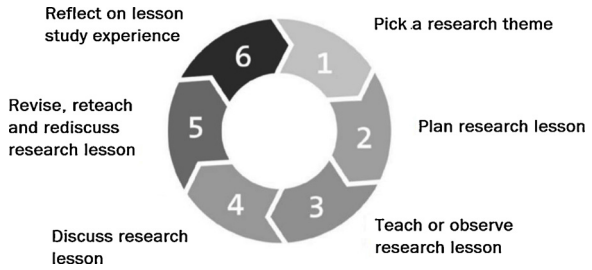

Fig. 1. Six stages of the Dutch lesson study cycle.

Table 2
Overview of core and optional elements of lesson study.

Element	Activity	Core/optional
0.	Share thoughts and ideas on education	Optional
I.	Start with a question or issue from teaching practice	Core
II.	Define clear research goal	Core
III.	Study data/publications/lesson material and share expertise	Core
IV.	Design research lesson (including observation forms) and write out research lesson plan	Core
V.	Teach research lesson, live observation, and collection of data	Core
VI.	Engage in in-depth conversation	Core
VII.	Repeat elements V and VI followed by a final reflection	Core
VIII.	Share results with others outside the lesson study team	Core
IX.	Seek guidance of facilitator familiar with the lesson study process	Optional
X	Implement input from knowledgeable other	Optional

studying of curriculum material (*kyouzai kenkyuu*) phase of Japanese lesson study as prescribed by the implementation fidelity perspective (Takahashi & McDougal, 2016).

A knowledgeable other "is someone from outside of the planning team with deep expertise in the content, often deep expertise in teaching, and much experience with lesson study" (Takahashi & McDougal, 2016, p. 515). In Japan, the knowledgeable other is present during the research lesson and gives the final remarks during the post-lesson discussion. During the LSPLN, teachers were assisted by two subject pedagogical experts. Although these experts were available for consultation on request after the LSPLN ended, they were no longer formally involved.

In addition, a lesson study cycle can include a facilitator, whose role is to guide and monitor the lesson study process. This person can be someone from the lesson study group or an outside member (Stepanek et al., 2007). Facilitators contribute to both the organization and quality of lesson study: they take care of negotiating agendas and priorities, enabling the group to focus on teaching and learning, and deepen group discussions by directing the group to the lesson goal (Ermeling & Graff-Ermeling, 2016). Though not considered a core element, in the current study, all teachers were prepared to become facilitators during the LSPLN. If they continued with lesson study in their own setting, they always took on the role of lesson study facilitator within the lesson study group.

2.2.3. Usefulness

In Japan, lesson study is considered fundamental for the practice of teaching (Watanabe, 2018), but outside Japan, teachers' evaluation of lesson study varies. Some studies report that teachers appreciate the opportunity lesson study provides to collaborate and share experiences with and knowledge about education (Mon, Dali, & Sam, 2016), though others show that teachers also question the use of the practice and doubt whether it is worth the time investment (Brosnan, 2014; Lee, 2008; Norwich & Ylonen, 2013). Although studies show that teachers interpret, perform, and evaluate lesson study differently, no research at present explores how these elements are connected. The current study explores this connection to gain insight into how lesson study can become embedded in new contexts. Herein, we address the following research questions:

1 What do teachers consider the general script of lesson study (ostensive)?
2 Do teachers continue to perform the lesson study (performative), and if so, how?
3 How do teachers evaluate the usefulness and feasibility of lesson study (usefulness)?

3. Method

3.1. Research context

This study draws on an LSPLN project undertaken at a university teacher education program in partnership with other teacher training schools and secondary schools in the Netherlands. We use data from 21 teachers from 14 secondary schools in the northern Netherlands who participated in two LSPLNs, one for math and one for Dutch, for four years (2014–2017). These networks were part of a project for (cross-school) LSPLNs launched by the Dutch Ministry of Education (de Vries & Prenger, 2017). During the project, teachers learned extensively about lesson study and the core principles of the practice. They participated in the previously mentioned six cycles of lesson study (Dudley, 2011; Stepanek et al., 2007) After four years, the LSPLN ended and university support and funding ceased. Teachers could decide for themselves whether and how to continue with lesson study, which 12 teachers from nine schools did.

3.2. Data collection

We conducted semi-structured, open-ended interviews with the 21 LSPLN former participants (see Table 3 for teacher characteristics), three of whom did not respond to the request for an interview or were not able to participate. Examples of interview questions include the following: "What phases do you consider part of lesson study?" (ostensive), "Is every phase of the cycle equally important?" (ostensive), "Which phases of the research cycle do you perform?" (performative), and "To what extent do you think

Table 3
Sample descriptions.

Descriptive	Data
Gender	4 male (19 %)/17 female (81 %)
Age (in years)	M = 41,86, SD = 1133 (range: 26–59)
Teaching experience (in years)	M = 14,24, SD = 908 (range: 5–37)
Teacher qualification	M.Ed.: n = 11 (52.4%)
	B.Ed.: n = 10 (47.6%)
Main teaching subject	Dutch n = 11 (52.4%)
	Math n = 10 (47.6%)

lesson study is worth the time investment and why?" (usefulness). Interviews had an average duration of 60 min and were audio recorded and transcribed verbatim.

3.3. Data analysis

The data analysis involved two steps. First, we developed a coding scheme based on Feldman and Pentland (2003), which distinguished the ostensive and performative aspects and Witt (2011) to examine teachers' evaluation of lesson study's usefulness. Step two consisted of grouping, analyzing, and discussing coded segments with the aim of examining the extent to which teachers maintained or modified the lesson study practice as presented during the LSPLN. We identified four distinct perceptions of how teachers considered the general script or idea of lesson study: 1) developing a shared vision, 2) lesson planning, 3) observing students, 4) researching student learning and enhancing pedagogical content knowledge (PCK). PCK is "the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adopted to the diverse interests and abilities of the learners" (Shulman, 1987, p. 8). The perceptions, in turn, connected with whether and how lesson study continued to be performed and how teachers evaluated the usefulness of the practice. One teacher had two perceptions of the general idea of lesson study. His ostensive understanding of lesson study differed depending on the specific lesson study group he was in: For his own department, he maintained the ostensive element and considered the general idea of lesson study researching student learning and enhancing pedagogic content knowledge (PCK), but for groups he had set up with other departments, he saw the general idea as lesson planning. In the following section, we have translated quotes from the interviews from Dutch to English to illustrate the results.

4. Findings

Regarding the ostensive aspect (the general script), we found four perceptions of the general idea of lesson study. We observed no correlation between which perception participants had and subject matter taught, level of experience, or gender.

Next, we describe the results for each research question for each perception of the general idea separately. We use the overview of core and optional elements of lesson study to structure our results by beginning with the perceptions which focuses on elements of phase 0 and continuing with perceptions that focus on later and/or more phases. For each perception, we describe if and how the lesson study routine was performed and how teachers conceived of lesson study's usefulness (see Table 4 for a summary of the results).

4.1. Lesson study as developing a shared vision on education

4.1.1. Ostensive

One teacher, Ann, focused specifically on the initial phase of lesson study, in which the team is encouraged to share and discuss views on education. She explained that for her, the ultimate goal of lesson study was to collaborate to develop a shared vision. At her K – 9 school, she had used lesson study to allow a specific team to collaborate as a means to create more stability within the group. She viewed lesson study as a way to create a collaborative learning environment and work toward a shared vision among the members. In this sense, Ann modified the general script of lesson study by focusing specifically on phase 1.

4.1.2. Performative

Ann had begun performing the cycle at her school with a team that needed more stability, a group of homeroom teachers[1] who taught various subjects. She had divided the teachers into three lesson study groups and had planned to go through all the phases of the cycle. However, because she started late in the school year, when teachers had many obligations, they had to stop before any of the groups had completed the cycle. She explained that it was quite difficult to keep her colleagues present and engaged. For example, during the post-lesson discussion she struggled to keep colleagues focused and interested. Ann's performance of the cycle was incomplete, and she had no concrete plans to perform the cycle in the future.

[1] In the Netherlands, teachers typically have a home group with which they meet once every few weeks depending on the needs of the group and their level (lower levels have more contact hours than upper levels).

Table 4
Summary of results.

	Perception	Ostensive	Performative	Usefulness	Number of teachers with this perception[a]
1	Shared vision	Script focuses mostly on phase of sharing views on education	Not finished and no concrete plans to continue	Design not useful to create a shared vision	1
2	Lesson planning	Script focuses mostly on the lesson planning phase	Either not implemented or shortened and simplified	Design not useful for lesson planning	7
3	Student observation	Script focuses mostly on the observation phase	Either not implemented or intention to shorten and simplify	Design not useful for gaining insight into student responses	4
4	Researching student learning and enhancing PCK	Ostensive script includes almost all core elements	Mostly implemented as intended during the LSPLN	Design useful to enhance PCK and investigate student learning	10

[a] Jack has both perception 1 and 4.

4.1.3. Usefulness

Ann considered her time investment in learning lesson study worth it because of the opportunities it presented to exchange and discuss ideas with colleagues. However, her experience with the half-implemented cycle made her doubt whether lesson study was a good way to develop a shared vision. Instead, she thought it might be a prerequisite for lesson study rather than an outcome. In general, she noticed that her colleagues were less invested in the process than she was and were more willing to rush through the various phases. She believed a reason for this might be that the focus was not on the teachers' own subject. Overall, she did not consider lesson study appropriate for creating a shared vision.

4.2. Lesson study as lesson planning

4.2.1. Ostensive

Seven teachers conceived of the general idea of lesson study as lesson planning had focused specifically on the lesson planning phase. For example, Lisa stated that lesson study was "thinking well about a lesson or series of lessons", and Natasha described it as "making good lessons". As another example, Jack, who had formed three groups with teachers from other departments (history upper and lower levels and music), considered the ostensive script for these groups during lesson study to improve lessons and facilitate talking about education.

Apart from highlighting the lesson planning phase, teachers with this perception diminished the other phases of lesson study, explaining that they felt it would be more efficient and beneficial if the cycle was shortened and simplified. Lisa explained that she thought the preparatory work could be reduced by eliminating many of the phases preceding the actual lesson planning (e.g., formulating research and lesson goals). In addition, Sarah explained, "I think that to make a good lesson study lesson it is not necessary to have done very elaborate research". Hannah also considerably modified the general script of lesson study. She explained what she valued most:

> That you sit together and talk about the lesson material and that you learn from colleagues. That is the main benefit. But the entire cycle and then starting again, etc., that took quite a lot of time, and we considered that to be the biggest disadvantage: that you are spending a substantial amount of time on the preparation of a lesson, really a disproportionate amount. That you will have spent up to six hours for a lesson that takes forty-five minutes.

The aforementioned quotes show that in this perception of lesson study as lesson planning, the teachers modified the ostensive aspect of the lesson study script by highlighting the lesson planning phase and eliminating the importance of the other phases from the general script.

4.2.2. Performative

When teachers perceived of lesson study as lesson planning, only two teachers, Sarah and Jack, continued to perform lesson study in their own school, but they modified the cycle. Sarah explained that she had eliminated most of the research elements, such as formulating a research goal and anticipating student responses. Instead, she reported that she started the cycle by diving straight into lesson planning. Sarah explained, "Really very elaborately outlining the first phase and then philosophizing for hours on end what your higher purpose is and all that, we went through that rather quickly". Jack also modified the cycle: "The actual research, we omitted that a little. Writing down all the final conclusions. We do not do that, but we do say 'this is a lesson we want to teach. This is the goal. How can we achieve that goal'"? Both noted that they mostly used the group members' teaching experiences to plan the lesson. In summary, Sarah and Jack deviated substantially from the original cycle.

Importantly, their lesson planning no longer resembled the lesson planning phase of lesson study performed during the LSPLN, in which the lesson is part of the research process. It is specifically meant to be a research lesson, allowing teachers to collect data and subsequently discuss how their design worked to solve their research problem and answer their research question. By contrast, Sarah and Jack were not preparing a lesson that would allow them to investigate their research question, as this phase was often neglected, but instead were focused on developing and subsequently observing general lesson plans.

Hannah explained that though she was not planning to continue with lesson study as presented during the LSPLN, she did want to have more regular meetings with her department to discuss the teaching materials, because for her this was the most beneficial aspect of lesson study. However, she had no concrete plans yet to continue with this form of collaborative lesson planning.

4.2.3. Usefulness

When the general idea of lesson study was seen as lesson planning, the four teachers who did not continue with performing lesson study in their own schools expressed that they had not done so because they considered the practice too time consuming. They explained that lesson study took too much time to develop one lesson, and therefore they did not consider the design of the cycle useful and feasible. Lisa, for example, said, "It is really just very specific, really very small, right? It is really small, lesson study is small". In turn, Diane, commenting on lesson study cycles she did during the LSPLN, noted:

> It was definitely not worth the time investment. That took so much time. The whole discussion cycle after you have taught the research lesson, that just takes so much time if you do all the phases. Well, then I do not believe it has had sufficient returns. But maybe if you can do it in a smaller form within the school, well, then it might be more effective.

The two teachers who had performed lesson study were more positive about the returns of the cycle. Jack considered lesson study worthwhile because of the developed lesson it yielded and because insights gained from observing the lesson being taught transferred

to other lessons. However, he stressed that for lesson study to be worthwhile, the cycle needed to be shortened and simplified, as he had done. Sarah, in her evaluation of the cycle, doubted whether lesson study was worth the time investment for planning a lesson. When teachers perceived of the general idea of lesson study as lesson planning, teachers considered lesson study not appropriately designed for lesson planning and, therefore, too time consuming. The teachers who continued performing (aspects of) lesson study had reduced the time investment and modified the cycle to balance this time commitment out, forcing the performance of the lesson study cycle to fit their conceived ostensive script.

4.3. Lesson study as observing students

4.3.1. Ostensive

A third group of teachers perceived of the general script of lesson study as observing students. Four teachers focused specifically on the observation phase in their ostensive script of lesson study. They all mentioned that for them, lesson study was primarily about gaining insight into student responses. Meg and Charlotte tied the insights gained from observation to lesson planning, explaining that the insights into how students actually respond were useful to improve lessons. Teachers with this perception differed from those in the fourth perception of the general idea of lesson study as researching student learning and enhancing PCK in that none connected gaining insight into student responses with better understanding of student learning. Instead, they focused on how observing students allowed them to gain insights into the complexities of classroom communication. For example, George noted that it provided the following:

> A better insight into how students can respond. Students can really react very differently than what you expect, and you need to take that into consideration. There are a lot of things that escape you during a lesson. That is really alarming. Lesson study gives you a greater awareness that you need to be really precise when expressing something. Even then, it then can still go wrong, and you need to check in some way how things come across.

In addition to highlighting the observation phase as the most important phase, teachers downplayed the importance of the other phases of lesson study as presented during the LSPLN. For example, Meg considered the preparatory phase to set up the research lesson too time consuming. She did not consider it essential for lesson study and planned to reduce it during future cycles. She explained, “Formulating the research question really well and in addition to that formulating your lesson goals, I have noticed this is really time consuming … but then I do think this can be done somewhat more quickly”.

Instead of a continuous collaborative form of teacher research, Charlotte and George considered the insight into student responses only once; this led them to modify the ostensive script of lesson study. George considered the insight into student responses quite powerful during the first cycle. However, he explained, “The whole circus of coming together and having to prepare a lesson and then also having to teach that lesson and observe, I do not dare to say that is really necessary. The awareness is really important”. He added that after this awareness is gained during the first cycle, it does not require further repetition in subsequent cycles to develop further.

4.3.2. Performative

Of the teachers with the perception of lesson study as student observation, only Meg continued to perform lesson study in her own school. She first tried to get her department involved, but no one was willing to participate in the cycle. As a result, she set up lesson study as part of her role as teacher educator with the teacher trainees. She reported that she ran two lesson study groups with teacher trainees, and for the first cycle, she went through all the core phases. However, for future cycles she intended to reduce research elements of the phases leading up to the observation phase and focus mostly on the observation phase. The other teachers did not continue to perform lesson study for various reasons. Lucy said her department was willing to undertake lesson study, but she indicated she would only start once school leadership gave credit for the group to spend time on lesson study, which was not yet the case. Charlotte and George said that they had tried to form a group with their department but were not successful.

4.3.3. Usefulness

When teachers perceived of lesson study as student observation, all teachers were critical of the time investment lesson study required. Teachers did not consider lesson study well designed for gaining insight into student responses. For George and Charlotte, the continuous repetition of the research cycle was not commensurate to the insight that it yielded. Even when the insight into student responses was not considered once-only, the research cycle – especially the preparatory work to design the research lesson – was not considered essential.

4.4. Lesson study to research student learning and enhance pedagogic content knowledge

4.4.1. Ostensive

A fourth perception found amongst teachers was lesson study as researching student learning and enhancing PCK. Ten teachers had this perception of the general idea, which maintained most of the ostensive script of lesson study as presented during the LSPLN. Teachers with this perception of the general idea of lesson study modified phase 6 slightly by including only reflection on the entire lesson study process and not sharing their gained insights with the wider staff. Throughout their descriptions of the importance of the phases, they highlighted the ways each phase was relevant to enhance pedagogic content knowledge (PCK) and investigate student learning. For example, teachers also focused on student reactions, similar to teachers who perceived of the general idea of lesson

study as observing students. However, here teachers stressed that observation enabled insight into how students learn their subject instead of creating an awareness of the complexities of classroom communication. For example, Betty explained that reviewing what students write down allowed her to understand the deeper reasons they, for example, struggle with square roots, which was the specific research question of the cycle. In addition, teachers understood the cycle as a research process. For example, Kim stressed that lesson study was about "collectively formulating an educational or didactical learning problem and improving that based on the responses of students". Overall, teachers who perceived lesson study as researching student learning and enhancing PCK viewed lesson study in line with how it was presented during the LSPLN – namely, as a research cycle – and maintained most of the ostensive script of lesson study.

4.4.2. Performative

Of the 10 teachers who perceived lesson study as researching student learning and enhancing PCK, eight continued to perform the cycle. Seven teachers followed the ostensive script as intended and went through almost all the phases as they had done during the LSPLN. For example, Joyce explained that she kept close to the cycle. She went through all the initial steps in phases 1 and 2, such as formulating learning goals, establishing research questions, and predicting student responses. Joyce also indicated that she closely followed the manual to facilitate the post-lesson discussion to ensure everyone contributed and stayed on topic. In some cases, teachers deviated from the original procedure by, for example, scheduling more than two research lessons to solve scheduling difficulties. For example, Peter had had to plan six different research lessons to enable all his team members to observe. With his own department, Jack ran the cycle as intended and went through all the phases (though not with other departments). He also sought out additional literature to design the research lesson for himself and his colleagues. Most teachers with the perception of lesson study as researching student learning and enhancing PCK left out half the final phase that consisted of sharing the results and insights of the cycle with teachers outside the research team.

Jill significantly adjusted the cycle. She explained, "Now we do less, or maybe nothing at all, with assessing student responses before observing. So we ditched the observation form. The real research, we actually threw that out as well". She also no longer collected student data during research lessons, noting, "It is more practically oriented now, in the sense of just asking: What do I see and what does that mean for my next lesson? And if I would teach it again, what would I do differently?" All teachers indicated that they mainly investigated ways to design the research lesson by exploring their own (practical) knowledge or looking up examples of good practices online.

4.4.3. Usefulness

All teachers with the perception of lesson study as researching student learning and enhancing PCK were positive about lesson study and considered the research cycle appropriate for enhancing PCK. Three elements recurred in respondents' explanations of why they valued the cycle. First, they appreciated being able to focus on their own subject matter and how their students learn their subject. Second, they valued the collaborative nature of the process, and third, the practical relevance of lesson study made the practice worthwhile, as they could take what they learned during the cycle and use it immediately in their further teaching. Regarding the third element, participants explained that practical relevance could be found not only in the developed material that could be used but also in terms of the insights into PCK that were gained. For example, Joyce described the value of lesson study as follows:

> Learning together, learning from each other is very important, and there is a heavy focus on student behavior and student learning. I think those are the success factors. And also the deeper focus. Not just superficially deciding what you are going to do tomorrow, but preparing everything on a very detailed level. Those are the elements that make lesson study successful.

When lesson study was perceived as researching student learning and enhancing PCK, teachers all considered lesson study worth the time investment. Anna explained, "It is a lot of work, but you get so much in return, and it is also a very nice way to engage with your subject". For Holly, similar considerations were present in her evaluation of lesson study. She commented: "What I really enjoy about it is collaborating with colleagues on your own core subject. I think it is very valuable to do this with colleagues, to work on my subject and on the learning of students. Students improve and that improves my teaching".

Jill also indicated that she considered all elements of the cycle important. However, she explained that she had adjusted the cycle to keep her colleagues engaged, as they did not value the research elements, considering them too time consuming. After the adjustments, she no longer felt able to enjoy and learn from the cycle herself and said she felt considerably less enthusiastic about the process than when she had during the LSPLN. Overall, when lesson study was perceived as researching student learning and enhancing PCK, teachers valued lesson study, considering the design of the cycle appropriate for (collaboratively) researching student learning and enhancing PCK.

5. Conclusion and discussion

5.1. Lesson study

We aimed to investigate how teachers create lesson study as an organizational routine and gain insights into how lesson study can become embedded in contexts outside Japan. One of our main findings is that teachers varied in whether they maintained or modified the ostensive aspect of lesson study as presented during the LSPLN. Moreover, the results showed that teachers' ostensive understanding connected with the performative aspect and their evaluation of its usefulness. When teachers perceived lesson study as

researching student learning and enhancing PCK, teachers mostly maintained the ostensive aspect of lesson study. In this perception of lesson study almost all the phases of the cycle were part of teachers' general script of lesson study. Teachers with this perception were both most willing to perform all phases of the research cycle and most likely to consider the design of lesson study useful. In the other perceptions of the ostensive (shared vision, lesson planning, and student observation) teachers' general script of lesson study focused on only one of the phases as presented during the LSPLN. In these perceptions of the ostensive, teachers often indicated that they did not want to continue with lesson study in their own schools and believed the cycle was not appropriately designed and, therefore, not useful. They considered the cycle too lengthy for what they thought it yielded: one lesson plan or a one-time insight into student responses. If teachers did continue to perform lesson study, they modified the cycle, considering many elements inessential and too time consuming.

A possible explanation for the differences in the ostensive script of lesson study among teachers can be found in the literature. People can adjust the ostensive aspect of a routine by going through successive performances of it (Feldman & Pentland, 2003; Spillane, 2012). Organizational routines are not stable; rather, they are subject to change as teachers go through a "processes of variation, selection, and retention that takes place between the ostensive and performative aspects of the routine" (Feldman & Pentland, 2003). Applied to our results, this could mean that as teachers went through the LSPLN's six research cycles, some might have changed the ostensive aspect of the practice, transforming it from teacher research to lesson planning or student observation.

Our finding that maintaining the ostensive aspect of lesson study leads to richer implementations of the practice also aligns with what we know from implementation literature. Studies show that teachers must maintain the core elements of an innovation to avoid lethally adjusting the practice (Quinn & Kim, 2017). The results indicate that perceiving lesson study as researching student learning and enhancing PCK, teachers were both most able and most willing to embed lesson study as an organizational routine in their own settings. If teachers with other perceptions of lesson study continued to perform the cycle it was modified to such a degree that the teachers' practices aligned more with other PD practices such as collaborative lesson planning or collegial observation. These teachers continued with a practice that no longer captured the core elements of lesson study, though they did seem to continue a change process that may have been initiated by the LSPLN. Although lesson study itself was not embedded, the teachers implemented an adapted practice, which they reported offered them valuable learning opportunities.

However, if the goal is to embed long-term, school-based PD in schools, our results show that teachers' ostensive understanding of the PD is crucial. Only when teachers maintained the ostensive script of the PD was the practice most likely to be (almost completely) embedded in the school. In all other cases, teachers either were unwilling to continue or, if they did, lethally adapted the practice into something that no longer contained all characteristics of the PD practice.

5.2. The research cycle

Our results are in line with previous findings that teachers leave out elements that distinguish lesson study as an inquiry process (Seleznyov, 2018). Our results show that including research elements is crucial for embedding the ostensive script of lesson study. Teachers who did not perform the research elements did not consider these aspects necessary parts of the general script of lesson study. Lesson study was no longer viewed as a form of teacher research but as mostly about either lesson planning or observing students However, if lesson study was seen as researching student learning and enhancing PCK, teachers explained that they needed the research elements to assess student learning – in other words, to perform their ostensive script of the practice.

A pattern running though almost all performative aspects of lesson study was the focus on sharing personal teaching experience and good practices as a way to design the research lesson rather than undertaking a literature review or reading books or articles. This finding suggests that in our contexts, researching a topic by sharing teaching experience is preferable for teachers to investigate their research theme. It could also be an initial step in setting up a collaborative practice, as in the Dutch system it is relatively uncommon for teachers to discuss in depth one another's views on education (Snoek, 2017). Teachers also eliminated research elements during the continued performance of the cycle to make the practice more suitable to colleagues from whom resistance to research elements was expected. In Japan, teaching is considered research, and teachers are viewed as researchers of their own practice, which makes lesson study an integral part of the profession; however, outside Japan, this is not often the case (Akiba, 2016; Fujii, 2014; Hiebert & Stigler, 2017; Watanabe, 2018). As such, "perhaps the key factor for lesson study to be productive anywhere is for teachers to view teaching as research and to develop their own identities as researchers" (Watanabe, 2018, p. 10).

Teachers also reported specific factors (e.g., department dynamics, organizational factors) that influenced their ability to perform the cycle. In some cases, teachers expressed a willingness to perform the cycle but were unable to find motivated and enthusiastic colleagues who were willing to engage in collaborate learning. In this case, the predominantly individualistic nature of PD in the Netherlands may have been an obstacle to the development of collaborative professional cultures such as lesson study in schools (Snoek, 2017). How lesson study was organized also influenced the extent to which it was implemented. For example, teachers mentioned that both facilitation and scheduling influenced whether and how the cycle was performed.

6. Limitations

We acknowledge several limitations of our analysis. First, we focused on whether teachers did or did not embed lesson study as an organizational routine. However, we did not determine how much support these teachers received from school leaders, which is an important feature of embedding new practices (de Vries et al., 2017; Xu & Pedder, 2014). Future research should examine how teachers and school leaders can work together to embed lesson study in their schools.

Second, we focused on the teachers who were part of the PLN, not on their colleagues in the school who had not been part of this

network. Our results also indicate that the role of the colleagues of the former PLN teachers also limited the extent to which lesson study could be implemented. For example, Jill saw the general idea of lesson study as researching student learning and enhancing PCK. However, Jill's colleagues did not seem to share the same ostensive script of lesson study as researching student learning and enhancing PCK, but instead seemed to see it more as lesson planning, which limited Jill in performing lesson study as a research cycle. As such, future research should also pay attention to the role of colleagues.

Third, our research focused specifically on the Dutch context. Studies in other contexts are necessary to develop a more comprehensive understanding of how the ostensive aspect connects with the performative aspect and teachers' evaluation of the usefulness of lesson study. Our results shed light on specific contexts within Dutch secondary education; evidence from more settings will contribute to a more solid knowledge base of what is required to make lesson study work across various settings.

Finally, we focused on how teachers' implementation of the ostensive aspect of lesson study shaped the performative aspect and the evaluation of lesson study's usefulness. However, our results that show other factors also determined how lesson study was implemented in a school context. For example, the organizational context played a role when, due to scheduling difficulties, groups increased the number of research lessons. Other adjustments were made out of interpersonal considerations. Not all teachers were able to form a group because their department was not on board or the cycle was adjusted as a result of different ideas on education. As such, our results also show how difficult and intractable the educational practice can be. In general, other factors such as school culture, leadership, conceptions of teaching, teacher motivation, and self-efficacy can also influence perceived ostensive script and performance of lesson study (Saito, Khong, & Tsukui, 2012; Xu & Pedder, 2014).

7. Practical significance

This study illustrates the importance of teachers' understanding of the general script of the lesson study. Only when teachers' general script included the core elements of the cycle did they avoid lethally adapting lesson study. For lesson study to be embedded as a form of teacher research, teachers' general script must include core elements from the research cycle by, for example, creating time within the introduction of lesson study to explicitly discuss the core elements of the cycle. This finding is in line with the literature on educational change, which argues that a crucial first step toward embedding the initiative involves generating consensus on what the innovation is (Fullan, 2016; Wood, 2017).

In addition, our results show the difficulties of bottom-up implementation of PD. Many teachers struggled to spark interest among their colleagues in engaging in collaborative inquiry. In our context, teachers might have been especially challenged to continue with performing the research cycle at their own schools because colleagues had not been part of the LSPLN and were not familiar with the practice. As such, our results also show that teachers need support from school leadership to set up and embed lesson study in their own school settings.

8. Future research

Research should continue to investigate how PD such as lesson study can become embedded in school settings. Although an increasing number of educational scholars have begun investigating how organizational routines of PD develop (Hubers et al., 2017; Roegman & Riehl, 2015; Spillane, 2012), more work is still necessary. Our study shows that the ostensive aspect can vary considerably and that the maintenance or modification of the ostensive aspect connects with whether teachers (want to) embed lesson study in their own schools. However, why teachers maintain or modify the ostensive script is still unclear. By investigating how and why teachers make sense of lesson study differently, more insight can be gained into the challenges and process involved in why core elements are maintained or modified in the ostensive script. Studies have shown that educators differ in how they interpret, adapt, and transform new educational initiatives (Coburn, 2001; (Luttenberg, van Veen, & Imants, 2013)). Researchers could use sensemaking, or how people come to understand new messages and ideas (Weick, Sutcliffe, & Obstfeld, 2005), to investigate why teachers come to different conclusions regarding the ostensive aspect. Future research can explore connections between conceptions of teaching and sensemaking of lesson study, which could provide an explanation for differences found between teachers' perception of the general idea of lesson study. Generally, sensemaking is influenced by existing frames of reference, convictions, and beliefs (Coburn, 2001; Weick et al., 2005). Specifically, it has been shown that how teachers make sense of new educational initiatives is greatly influenced by their conception of teaching (Luttenberg, van Veen, & Imants, 2013).

Takahashi's (2017) discussion on the levels of teaching further supports the connection between the interpretation of lesson study and the conception of teaching. He presents three levels of teaching: 1) teaching as telling the important basics, facts, concepts and practices, 2) teaching as explaining meanings and reasons for basic concepts and practices, 3) teaching as providing students with opportunities to understand content and practices and support their learning. In Japan, teachers, at least at elementary level, strive to use level 3 teaching (Takahashi, 2017). If the core of teaching is seen as supporting student learning, lesson study - with its focus on investigating student learning - seems relevant. However, if teaching is seen as level 1, telling subject knowledge without a focus on how students learn the information, it becomes less straightforward to what extent researching student learning via lesson study is needed. This suggest that the real challenge for sustaining LS globally relates to coming to see teaching as supporting student learning in order to make the practice of LS relevant and useful for teachers. Future research should further investigate to what extent teachers' sensemaking of LS is connected to their conception of teaching. Especially, it should consider how teachers can come to see the idea of LS as collectively solving PCK problems into their frame of reference.

Although gaps in our understanding of the creation, maintenance, and development of organizational routines of PD remain, our study highlights the potential of applying the concept to examine whether and how new ways of working can become embedded in

school life. Gaining these insights can help lesson study fulfill its potential in supporting teacher learning and shed light on how lesson study can become a useful local adaptation instead of a lethal mutation.

Acknowledgement

We would like to thank Judith Warren Little for her very helpful feedback.

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